A STUDY ON THE EFFECTIVENESS OF TECHNOLOGY TRANSFER TOWARDS THE WORK PERFORMANCE IN SME'S

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ABSTRACT

This study was conducted to evaluate the effectiveness of technology transfer in small medium enterprise (SME's) manufacturing-based industry. Besides that, the objective of this research is to study the relationship between technology transfer and the work performance. In addition, this study attempt to recommend the best practice of technology transfers for a better work performance. Sets of questionnaires were developed and the data was collected by mail and hand distributed. Total sample of 75 respondents was used in this study. The result of this study showed that the effectiveness level of technology transfer that is used in that industry is good enough. Besides, the relationship between technology transfer and the work performance in terms of quantity of work and quality of work shows there are a strong positive relationship for both variables. Hence, there are lists of several recommendation of best practice of technology transfer for a better work performance in the end of this study.

Keyword:

Technology transfer : the process of transferring skills, knowledge, technologies, method of manufacturing, samples of manufacturing and facilities from one organization to another

Work performance : The work related activities expected of an employee and how well those activities were executed

ABSTRAK

Kajian ini dijalankan untuk menilai keberkesanan pemindahan teknologi dalam industri perusahaan kecil dan sederhana (PKS) berasaskan perkilangan. Di samping itu, objektif kajian ini adalah untuk mengkaji hubungan antara pemindahan teknologi dan prestasi kerja. Di samping itu, kajian ini cuba untuk mencadangkan amalan terbaik pemindahan teknologi untuk prestasi kerja yang lebih baik. Set soal selidik telah dibuat dan data dikumpulkan melalui pos dan edaran tangan. Jumlah sampel yang terdiri daripada 75 responden telah digunakan dalam kajian ini. Hasil keputusan kajian ini menunjukkan bahawa tahap keberkesanan pemindahan teknologi yang digunakan dalam industri tersebut adalah cukup baik. Selain itu, hubungan antara pemindahan teknologi dan prestasi kerja dari segi kuantiti kerja dan kualiti kerja menunjukkan terdapat hubungan positif yang kukuh bagi kedua-dua pembolehubah. Oleh itu, terdapat senarai beberapa cadangan amalan terbaik pemindahan teknologi untuk prestasi kerja yang lebih baik dalam bahagian yang terakhir kajian ini.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will discuss some introduction about small-medium enterprise industry (SME's), technology transfer and the work performance. The overall objective of this chapter is to identify the background of the study, problem statement, research objective, scope of the study, significant of the study and also the expected result of the study.

1.1 Background of Study

Increasing number of SME in developing countries has proven as a critical sector in enhancing economic growth and contributes to human development especially in eliminating poverty and boost up standard of living. SME's must be enabled to focus on both incremental as well as radical innovations to remain competitive (Arun, 2003). Technology cannot be denied as one of the importance tool in advancing SME to be more productive and cost efficiency. However there are few elements should be considered

before deciding to adopt or apply technology in the business operation. Transferring technology is not that easy, a lot of challenges need to be faced by both parties before any technology transfer happen. In addition, the challenge has open to wide opportunity for researcher to find the best level of technology to suite to SME (Mitchael, 2005). Most of the research done said that, transferring technology from research institutions to industry has always been a strategic issue (Hong Liu, 2000).

Technology transfer is said to be the best way in adopting technology among SME's. Mechanism of technology transfer namely licensing, joint venture and patenting is the most model used by the industry or business in accepting technology from technology provider or research institution. Technology transfer is "any process by which basic understanding, information, and innovations move from a university, an institute, or a government laboratory to individuals or firms in the private and quasi-private sectors" (Parker and Zilberman, 1993). On the other hand agree that, technology transfer provide knowledge and closing a gap between technology provider and technology acquirers (Arun, 2003). This process will benefited both parties in term of business development (Moira 2007). This process is very crucial as business always need to have high element of innovation which is always supported by a new technology as it is rapidly change. This movement of technology from one entity to another (Amanjeet, 2010) needs to be supported by the best model to ensure the successful the transfer. Escalating the value of technology transfer has intentional benefited both nations and companies (Hong Liu, 2000).

According to The Small and Medium Industries Development Corporation (SMIDEC) SMEs account for close to 99% of all the establishments in the manufacturing, services and agricultural sector, provide around 65 % of total employment and it is expected that the value added production of SMEs to be around RM120 billion or 50 % of total production in the manufacturing sector by 2020. Malaysian SME contribution to the GDP was only 32% in 2006 compared to that of 40% in the United States, 57% in Germany, 55% in Japan, 60% in China, 57% in Indonesia and Thailand at 38.9%. SMEs in Malaysia have focused on addressing limitation and enhancing their capabilities in area such as finance, expertise and intellectual property and technology. It is critically to bring a

front role in industrial linkages between SME and large companies or any institution in transferring the technology in the interest of developing SMEs.

1.2 Problem Statement

SME's industries tend to face some challenges and pressure due to technology transfer. Indirectly, this will affect the work performance among their employees. Innovation and the capacity to innovate are among the most important factors that affect an organizations competitiveness and performance. Due to their small size, managerial capabilities are limited as well as limited resources do face a challenging task in innovating.

Additionally, SME's as compared to larger firms are weakly structured in innovation. It also has a low market power and scarcity of resources in order to appropriate the benefit of their innovation. There are many other challenges that are faced by SME's in Malaysia such as lack of technology assessment mechanism, lack of technological infrastructure, lack of technical manpower and others.

One of the main factors that influences in the success or failure of enterprise is technology factor. Therefore, there is a need for SME's to adopt technology transfer, to reduce the gap with the larger firm. By this approach, it will give some positive impact to the work performance among the organization and indirectly, it will improve the organisational performance as well. The best use of technology no doubt enables enterprise in reducing cost of production, maintain consistency in quality, improve productivity and finally develop the competitiveness of the enterprise.

1.3 Research Objective

i) To evaluate the effectiveness of technology transfer.

ii) To study the relationship between technology transfer and the work performance
iii) To recommend the best practise of technology transfer for a better work performance

1.4 Research Question

i) How far the effectiveness level of technology transfers that being applied?
ii) Does the technology transfer and work performance have a significant relation?
iii) What is the best practise for a better work performance?

1.5 Scope of Study

For contributing to the further understanding of these related terms, the task of this study is to examine the relationship between technology transfer and the work performance in SME's manufacturing-based industry. This study will evaluate the effectiveness of technology transfer, the relationship between technology transfer and the work performance, and the best practise of technology transfer for a better work performance in that industry.

These studies will focus on the local SME's employees at Senai, Johor. The SME's has developed many technology transfers that have various impacts to their organization which will influence the work performance of their employees. The instrument that will be used to collect the data is questionnaire.

1.6 Significant of Study

The purpose of this study is to analysing the effectiveness of technology transfer and the work performance in SME's industry at Senai, Johor. There must be some effect of technology transfer that are applied in SME's whether a good effect or bad effect. Besides that, this study will investigate the problem related to the technology transfer in SME's. There have some issues of technology transfer that will be discuss in the context of SME's in this study.

These studies attempt to analyse the effectiveness of technology transfer in SME's and the relationship between technology transfer and the work performance. Besides, this study also will recommend the best practice that can be applied in that industry to have a better work performance among their employees. By doing this study, it will give some idea to SME's in increasing the work performance within their organization.

The variation of the effectiveness of technology transfer was acquired through analysing the impact to the organisation. Top management could then put their efforts on the determining the best practice of technology transfer for a better work performance in the organization. These all can help to improve the performance on an organization and further benefit both individual stakeholders' members and objectives of the whole project within SME's industry.

1.7 Expected Result

This study is important to identifying the nature of technology transfer in SME's. The researcher will find out the relationship between technology transfer and work performance through the survey questionnaire method. It can be said that the work performance in an organization also affected by the effectiveness technology transfer. Besides, the researcher could find out the effectiveness of transferring technology to the

business operation. Last but not least, researcher also will recommend the best practise to have better work performance among the organization. This will give benefit to both employee and the company itself.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will discuss on some of selected literature review and issues of technology transfer and work performance in small medium enterprise (SME's). The overall objective of this chapter is to develop knowledge and understanding the previous research finding regarding the topic that being research. Besides, this chapter will review the concept of technology, technology transfer, work performance and followed by the discussion about the relationship between technology transfer and the work performance.

'Technology' can be broadly interpreted as knowledge incorporated within artefacts, business methods or techniques, and 'technology transfer' has come to denote any situation in which technology crosses inter-organizational and intra-organizational boundaries. Collaboration can be particularly effective in the SME context. SMEs with limited resources to engage in R&D can develop this capacity through sharing knowledge in coalitions. This is reinforced by a recent longitudinal study that examined clusters of small businesses. These appear to have been successful in technology transfer. It was stressed that these successful industry– higher education collaborations had developed over a number of years, and that a key driver of success in each case was a committed individual or group with a fundamental belief in the benefits of collaboration. These 'champions' were

prepared to invest time, effort and money to overcome barriers that often beset industry–higher education partnerships.

2.1 The concept of technology

Past researchers have viewed and defined the term ‘technology’ from many perspectives and this has influenced the research design and results, negotiations around a transfer and government policies in general. Thus, the term technology has been given various definitions by previous literatures. According to Kumar et.al (1999) technology consists of two primary components: 1) a physical component which comprises of items such as products, tooling, equipment, blueprints, techniques, and processes; and 2) the informational component which consists of know-how in management, marketing, production, quality control, reliability, skilled labor and functional areas. Technology is always connected with obtaining certain result, resolving certain problems, completing certain tasks using particular skills, employing knowledge and exploiting assets (Lan and Young, 1996). The concept of technology does not only relate to the technology that embodies in the product but it is also associated with the knowledge or information of it use, application and the process in developing the product (Lovell, 1998; Bozeman, 2000).

Tihanyi and Roath (2002) propose that technology can include information that is not easily reproducible and transferable. Based on this argument technology is seen as “tacit knowledge (Polanyi, 1967) or firm-specific, secrets or knowledge known by one organization” (Nonaka, 1994). Technology as the intangible assets of the firm is rooted in the firms routines and is not easy to transfer due to the gradual learning process and higher cost associated with transferring tacit knowledge (Rodasevic,1999). Valuable technological knowledge which is the intangible assets of the firm is never easily transferred from one firm to another because the technological learning process is needed to assimilate and internalized the transferred technology (Lin, 2003). Earlier, Burgelman et al. (1996) refer

technology as the theoretical and practical knowledge, skills, and artefacts that can be used to develop products and services as well as their production and delivery systems.

Technology is also embodied in people, materials, cognitive and physical processes, facilities, machines and tools (Lin, 2003). Based on Sahal's (1981) concept, Bozeman (2000) argues that technology and knowledge are inseparable simply because when a technological product is transferred or diffused, the knowledge upon which its composition is based is also diffused. The physical entity cannot be put to use without the existence of knowledge base which is inherent and not ancillary.

The latest definition given by Mascus (2003) has broadened the concept of technology where technology is defined as 'the information necessary to achieve a certain production outcome from a particular means of combining or processing selected inputs which include production processes, intra-firm organizational structures, management techniques, and means of finance, marketing methods or any of its combination'.

2.2 The concept of technology transfer

The definitions and concepts of technology transfer have been discussed in many different ways based on the disciplines of research and according to the purposes of the research (Bozeman, 2000). Technology transfer has been defined as the shared responsibility between firms in ensuring that technology is accepted and at least understood by someone with the knowledge and resources to apply or use the technology (T. Warookun, R. A. Stewart, and S. Mohamed, 2005).

The technologies that resemble blueprint, machines, or materials are easily replicated and transferred (Lin, 2003). The literatures on technology transfer and international technology transfer are extensive and varied in perspective from various disciplines which include political science, economics, sociology, public policy, marketing and management of technology (Kumar et al., 1999). The issues that have been investigated, among other, are technology transfer process, appropriateness of technology,

cooperation and conflict between transfer countries, the success of technology transfer, and the social and economic benefits of technology transfer for both suppliers and recipient countries.

Nevertheless, the main beneficiary of this learning process is the country or firm on the lower technological trajectory. There are studies showing technology transfer between foreign affiliates and local enterprises between developed and developing countries B.Javorcik, 2004 on Lithuania and Garrick and Gertler on Indonesia. Past literatures have referred technology transfer as the transmission of know-how to suit local conditions, with effective absorption and diffusion both within and across countries (Chung, 2001; Kanyak, 1985).

Since the term "technology transfer" provides many dimensions, it has often been used to describe the process by which ideas and concepts are moved from the laboratory to marketplace (Phillips, 2002; Williams & Gibson, 1990), the transfer and knowledge and concept from developed to less technologically developed countries (Derakhshani, 1983; Putranto et al., 2003) and the transfer of inventive activities to secondary users. Autio and Laamanen (1995) suggest a broader definition by proposing that technology transfer involves an intentional, goal-oriented interaction between two or more social entities, during which the pool of technological knowledge remains stable or increases through the transfer of one or more components of technology. Levin (1996) considers technology transfer as the application of scientific principles to solve practical problems.

From the social science perspective Levin (1993) defines technology transfer as a socio-technical process implying the transfer of cultural skills accompanying the movement of machinery, equipment and tools. This definition includes the transfer of the physical movement of artefacts and the embedded cultural skills. Majority of the previous studies have defined technology transfer as the transmission or movement of knowledge as a process. It involves the process how an organization or a country transfers scientific or technological achievements, new uses for technology, designs, and the technical knowledge that can be used in production (Chun 2007). The process that involves does not only concern about the transmission of knowledge but it is also relate to a learning process

where technological knowledge is continually accumulated into human resources that are engaged in production activities.

The technology transfer concept is not only concern about the transfer of technological knowledge or information but also the technology recipient's capability to learn and absorb technology into the production function (Maskus, 2003). Farhang (1997) suggests that transfer of technologies in cases of manufacturing processes requires not only the transfer of technological knowledge in the form of process sheets, blueprints, products, and materials specification but also the transfer of know-how of high-calibre engineering and technical personnel. The absence of technological spillovers is generally explained by the lack of absorptive capacity of the local firms (L. Jabbour and J. L. Mucchielli, 2007). There are studies highlighting the economic progress of developing nations from being recipients of new technology (F. Najmabadi and S. Lall, 1995)

In their extensive review on technology transfer literature from various disciplines, Zhoa and Reisman (1992) view that economists often define technology transfer on the basis of the properties of generic knowledge where the main focus is on variables that relate to production and design. Zhoa and Reisman (1992) identify that bulk of the technology transfer literatures have also been contributed by the management researchers. On the other hand, the management researchers tend to focus on intra-sector transfer and relationships between technology transfer and strategy (Rabino, 1989; Chiesa and Manzini, 1996; Laamanen and Autio, 1996; Lambe and Spekman, 1997). Most of the literatures on management have shifted their focus to alliances among enterprises and how alliances are crucial to the development of technology transfer (Zhoa and Reisman, 1992).

This is facilitated through enhanced organizational performance and innovation capabilities as a result. Based on these discussions, on the one hand it is hypothesized that organizations' resource availability and absorptive capacity have positive impacts on technology transfer whereas the perceived level of opportunistic behavior is negatively related to technology transfer. On the other hand, technology transfer is hypothesized to have positive impacts on organizational performance and innovative capabilities.

2.3 The concept of work performance

The meaning of work performance in the field of organizational behaviour has changed over the last forty years. Research has shifted from a focus on jobs and their fixed tasks to a broader understanding of work roles in dynamic organizational contexts (Ilgen & Hollenbeck, 1991). Traditionally, work performance was evaluated in terms of the proficiency with which an individual carried out the tasks that were specified in their job description. From this perspective, a "well-specified job" was one in which all of the behaviors that contribute to organizational goal attainment were captured within an individual's job description (Murphy & Jackson, 1999). Work performance could then be evaluated in terms of outcomes achieved by the quantity of work done and the quality of work itself (Campbell, McCloy, Oppler, & Sager, 1993).

The changing nature of work and organizations has challenged traditional views of individual work performance (Ilgen & Pulakos, 1999). Two of the major changes are the increasing interdependence and uncertainty of work systems (Howard, 1995). Early approaches to work performance did not account for the full range of behaviors that contribute to effectiveness when systems are uncertain and interdependent (Campbell, et al., 1993; Murphy & Jackson, 1999). In response to this limitation, new constructs have been introduced that encompass an expanded set of responsibilities. These constructs include citizenship performance (Smith, Organ & Near, 1983), contextual performance (Borman & Motowidlo, 1993), adaptive performance (Hesketh & Neal, 1999; Pulakos, Arad, Donovan & Plamondon, 2000), and proactivity (Crant, 2000; Frese & Fay, 2001; Parker, Williams & Turner, 2006).

As noted by Rotundo and Sackett (2002), there is now a proliferation of partially overlapping constructs within the performance literature. There is currently no theoretical framework for differentiating and integrating the various constructs that describe individual performance and its link to effectiveness. Although performance frameworks and taxonomies have been developed (e.g., Borman & Motowidlo, 1993; Campbell, et al., 1993; Johnson, 2003; Welbourne, Johnson & Erez, 1998), none captures the spectrum of

recent performance constructs while providing a theoretical rationale for defining different dimensions and linking them to the context in which work is performed. Based on the above distinction between formalized and emergent roles, we identify three different subdimensions of work role performance.

The first dimension of work role performance is termed “proficiency” and describes the extent to which the individual meets role requirements that can be formalized. It is possible to assess proficiency when the requirements of a work role are formalized because there is a clear standard against which these judgments can be made. The second dimension is termed “adaptivity” and describes the extent to which an individual adapts to changes in the work system or work roles. The third dimension is termed “proactivity” and describes the extent to which the individual takes self-directed action to anticipate or initiate change in the work system or work roles. Adaptivity and proactivity are important whenever the work context involves uncertainty and not all aspects of work roles can be formalized.

The nature of work roles cannot be divorced from the context in which they are enacted (Ilgen & Hollenbeck, 1999), so models of work role performance should incorporate theoretical features of the organizational context (Hattrup & Jackson, 1996). Despite the relevance of role theory, previous applications have focused on the process of role development rather than the way context relates to the dimensions of performance (Ilgen & Hollenbeck, 1999). Although a number of researchers have proposed that role theory is useful for describing a broader set of work responsibilities (e.g., Ilgen & Hollenbeck, 1991; Morgeson, Delaney-Klinger, & Hemingway, 2005; Welbourne, et al., 1998), this research has not formally included the organizational context, nor has role theory been used to describe the dimensions of a work performance model.

The potential for an individual to contribute to effectiveness at the team or organizational level depends on the embeddedness of their work role in the social context (Murphy & Jackson, 1999). When the activities of a work role are independent of others, then there is a simple link between the behavior of an individual and their effectiveness as an employee. When the activities of work role are interdependent with other roles, then the link between behavior and effectiveness is more complex. It is also important to note that